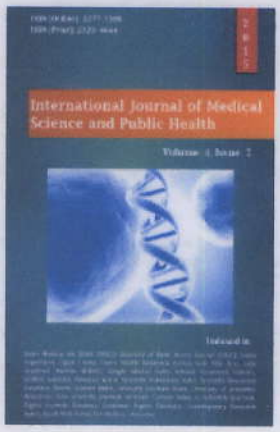

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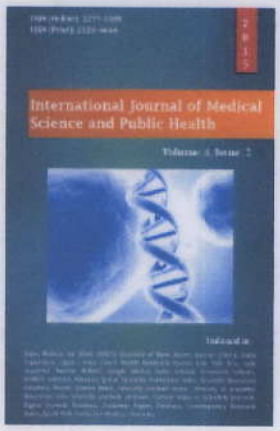

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Review Article

Micronutrients and growth of children: A literature review

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Abstract

Optimal growth and development in children will be able to be achieved if the nutritional needs can be met. There are many teenagers who are malnourished because of inadequate intake. This study aims to examine the relationship between micronutrient especially folic acid and zinc with growth. The method used is a literature review of various sources of free accredited journals in pdf form eg PubMed, Proquest, Google Scholar and EBSCO. Other sources were such as books, reports national and international health. We collected literature published in the last 10 years to maintain the novelty of information. Some sources of literature were beyond the time limit if those are beneficial to this study. The results of the literature review indicate that there is a relationship between micronutrient and growth but this is still being debated. This study recommends for further follow-up especially on experimental studies in certain age groups.

KEY WORDS: Micronutrients, folic acid, zinc and growth

Introduction

Optimal growth and development in children will be able to achieve if the nutritional needs can be met. However, in reality, there are many teenagers who are malnourished due to inadequate intake and the presence of infectious diseases.[1] Micronutrients, to the attention of many people especially public health experts and nutrition, are directly related to the growth and intelligence. Although, the data deficiency of zinc as an essential part of the micronutrient in Indonesia, for example, seems to be not yet fully available, but need to be aware of this possibility prevalence of zinc deficiency. A study conducted in the northeastern province of Thailand showed that about 70% of school children have low zinc levels and potentially affect their academic ability and growth.[2,3] Furthermore, the lack of zinc can provide a wide range of impacts e.g. somatic growth of children and endocrine systems as well as inhibition of sexual maturation, hypogonadism, and thyroid dysfunction.[4]

Food and Agriculture Organization has set 4 strategies to solve the problem of micronutrient deficiencies, such as (1) the diversification of food, (2) food fortification, (3) supplementation with vitamins and minerals, as well as (4) the measurement of global public health and disease control.[5] Food fortification is one of the best strategies because it has economic value with a higher level of compliance, so this way is more effective in reducing nutrient deficiency problems. In addition, fortification can also be used as a means of safe and effective way to supplement your diet with a low content of iron. Some countries have made efforts fortification in some products such as flour, oil, soy sauce, noodles, and rice.[6,7]

In Indonesia, rice fortification can be a prospective strategy in addressing micronutrient deficiencies because rice is the main commodity. Almost all of Indonesia's population consumes rice. According to data Susenas in 2013, that the average consumption of rice per day of Indonesia's population reached 263.9 g/person, and not much difference between consumption in urban areas (253.3 g/person/day) and rural (274.4 g/person/day). Currently, the rice is only able to contribute calories but low in micronutrients such as folic acid, vitamin B1, niacin, iron, and zinc. Therefore, through the fortification of rice can provide micronutrient intake when consumed.[8]

Based on the cost estimates by some experts that in addition to iron, which is known cost-effective in the fortification

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Sadeghi et al.[25]	To present data from the association of plasma zinc, copper and toxic elements of lead and cadmium levels with bone mineral density in Iranian women.	No differences were found in the nutritional status, number of diseases, drugs, and functional activities between these groups. Plasma Zn, Cu, Pb, Cd levels were analyzed by, a method of voltammetry. Mean ± SD levels of copper and zinc was 1.168 ± 0.115, 1.097 ± 0.091 µg/ml in control group, 1.394 ± 0.133, 1.266 ± 0.11 µg/ml in total patient (TP) and 1.237 ± 0.182, 1.127 ± 0.176 µg/ml in mild patients (–1 > T-score >–1.7), 1.463 ± 0.174, 1.327 ± 0.147 µg/ml in severe patient group (T-score <–1.7); respectively. Mean ± SD plasma level of lead and cadmium was 168.42 ± 9.61 ng/l, 2.91 ± 0.18 ng/ml in control group, 176.13 ± 8.64 ng/l, 2.97 ± 0.21 ng/ml in TP, 176.43 ± 13.2 ng/l, 2.99 ± 0.1 ng/ml in mild patients, 221.44 ± 20 ng/l and 3.80 ± 0.70 ng/ml in severe patient group, respectively. In this study plasma zinc, copper, lead, and cadmium concentrations were higher in the patients than in the control, though differences were not significant. However, differences were higher between the controls and patients with severe disease (T-score <–1.7). In addition adjusted T-score of femur with age and BMI showed negative significant correlation with plasma levels of zinc and lead in total participants ($p < 0.05$, $r = -0.201$, $p = 0.044$, $r = -0.201$).
Shaikhkhalil et al.[31]	To evaluate the effect of enteral zinc supplementation on weight gain and linear growth in ELBW infants with CLD who received volume-restricted fortified human milk.	Zinc supplementation started at postmenstrual age 33 } 2 weeks. Most infants received fortified human milk. Weight gain increased from 10.9 before supplementation to 19.9 g kg–1 day–1 after supplementation ($p < 0.0001$). Linear growth increased from 0.7 to 1.1 cm/week ($p = 0.001$). Zinc supplementation improved growth in ELBW infants with CLD receiving human milk. Further investigation is warranted to re-evaluate zinc requirements, markers, and balance.

Acknowledgement

This study is part of a study of literature that has been adapted from my Doctor Program at the Medical Faculty of Hasanuddin University, Indonesia. Therefore, our gratitude goes to the promoter and co-promoter as well as to the Indonesian government who have helped in completing this study.

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